MSG-079 C-BML Workshop
Farnborough UK, Feb 24-25 2010

Lessons Learned from MSG-048

MSG-048

Pegasus
SIMULATION SERVICES

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- OUTLINE
  - **Background**
  - Technical Lessons Learned
  - Operational Lessons Learned
  - Conclusions
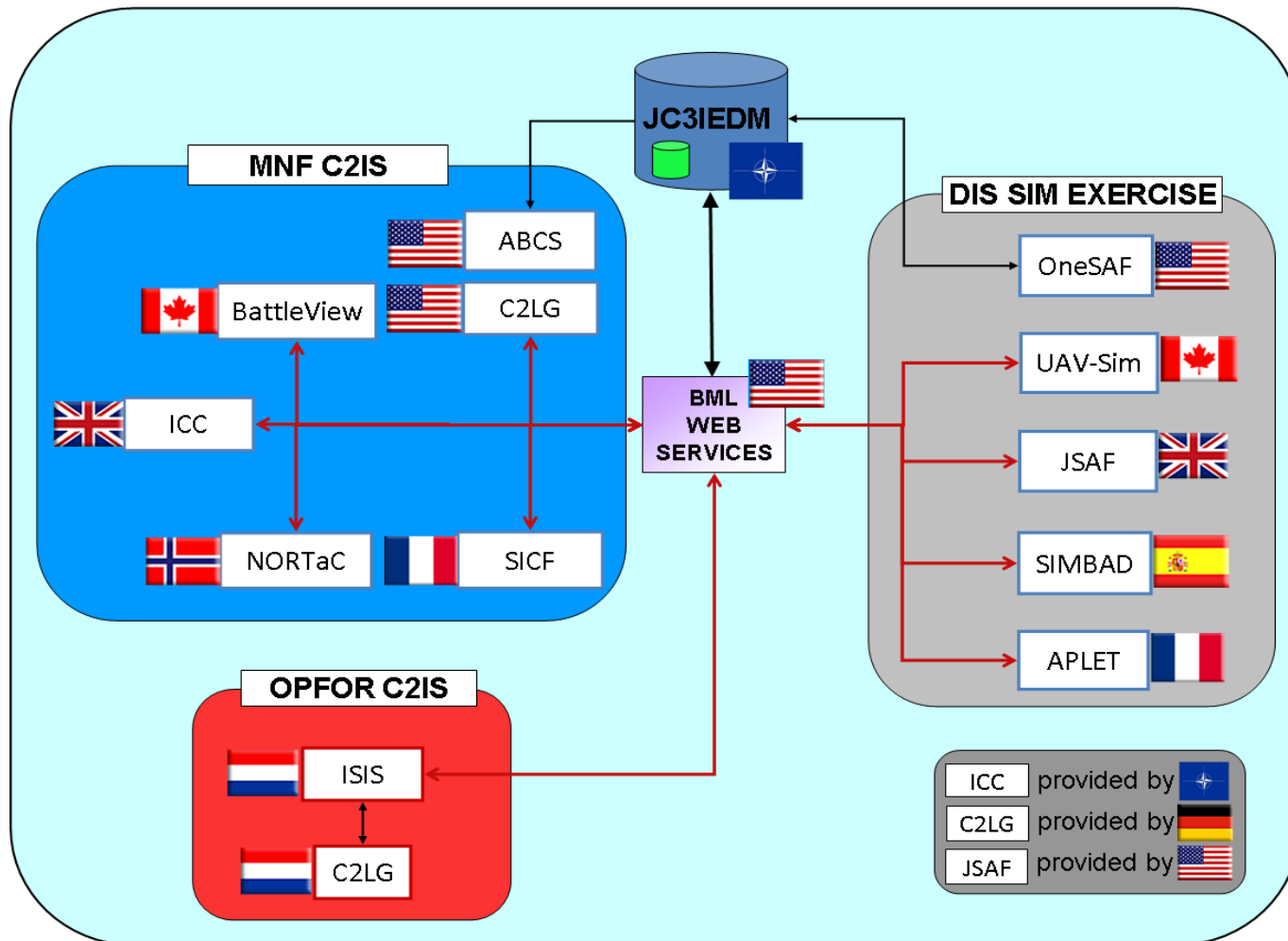
Lessons Learned from MSG-048
Background

- Three-year experimentation programme

- Many discussions, papers and reports

- Input from final 2009 experimentation event
  - Internal, MSG-048 discussions
  - External, Operational SME Feedback

Lessons Learned from MSG-048
Background

MSG-048 2009 Experimentation Architecture

Lessons Learned from MSG-048

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Lessons Learned from MSG-048
BML - Language Constructs

- Basic support for reports and orders:
  - Reports, Position/Contact, General/Op Status, Task Status
    - Bundled (instead of single) reports - for performance
  - Tasking
    - Multiple-task orders
    - Temporal associations
    - FRAGOs

- Relatively simple schema, yet
  - Significant enabler for C2-simulation interoperability
  - Encouraging for future, more complete versions
  - **Much work yet to be done.**

Lessons Learned from MSG-048
BML Infrastructure

- Experienced high reporting rates during scenarios
  - Created load on BML infrastructure (e.g. Server)
  - Contribute to information overload of
    - BML clients & infrastructure
  - **High throughput rates must be assumed**

- Made judicious use of Publish & Subscribe
  - Previous experimentation (e.g. 2008) used only client-server architecture
  - Subsequent polling led to information bottlenecks
  - **Combined Web Service/Publish & Subscribe (e.g. 2009) greatly improved information flow**

Lessons Learned from MSG-048
BML Infrastructure

- Validation
  - C-BML expression correctness
  - Transaction success

- Persistence functionality required for:
  - Record & Playback
  - Continuation of an exercise

Lessons Learned from MSG-048
BML Infrastructure

- BML Gateways/Translators are necessary – for now
  - External or non-intrusive interfacing to C2IS has significant advantages (e.g. Using actual C2IS as-is)

- In order to fully exploit BML-enabled capabilities , C2 and simulation systems will have to evolve
  - Integrate BML constructs into the applications

Lessons Learned from MSG-048
BML Infrastructure

- Scenario Initialization Needs (C2 & simulation systems)
  - Confirmed the need for a scenario definition language
    - e.g. Military Scenario Definition Language (MSDL)
  - Scenario initialization mechanism
  - Also need to coordinate the start-up sequence

- Run-time Scenario Management Needs
  - Late joiners
  - Re-joiners (e.g. following system failure, communication disruption)
  - Pause, Start, Re-start, Stop, Record & Playback

Lessons Learned from MSG-048
Requirements for BML-enabled Systems

- Characteristic Time Scales (e.g. publishing, processing)
  - C2 & Simulation Systems do not always have same characteristic time-scale
    - Simulations vary ~ from 10^{-2} to 1 S
    - C2IS ~ 1 S
- Some simulation systems run faster than real-time
  - May need to process reports before sending to C2IS
  - Simulation result can be used differently by C2IS
    - Common Operational Picture
    - COA evaluation

Can create a data producer/consumer issue!
Need to control the simulation reporting rates.

Lessons Learned from MSG-048
Requirements for BML-enabled Systems

- Information overload
  - Higher levels of automation and increased digitization of military information are factors that can contribute to the generalized situation of information overload at:
    - Network level
    - System level
    - Operator level

- Addressing information overload will likely require
  - Further development of interest management mechanisms, (e.g. more "smart-push")
  - Further work on automated information processing technologies
    - e.g. Intelligent agents, Intelligent Adaptive Interfaces

Lessons Learned from MSG-048 Requirements for BML-enabled Systems

- UAV Simulation provided encouraging results concerning the applicability of BML to controlling robotic systems
  - Introduced semi-automated level of autonomy
  - Utilized same interface as actual UAV Ground Control Station
  - BML input
  - STANAG 4586 output
  - **Successfully used prototype "command agent" approach**

Lessons Learned from MSG-048

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  - **Operational Lessons Learned**
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Lessons Learned from MSG-048
Operational Lessons Learned

- The following operational lessons learned are based, in large part, on feedback from SMEs at MSG-048 Final Experimentation in Manassas VA, Nov 2009

  - Questionnaires

  - Interviews

  - Discussions

Lessons Learned from MSG-048
Operational Lessons Learned

- ## SME Overall Impression
    - All operational participants strongly believed in BML concept
    - BML considered a valuable enabler to interoperability within coalition forces
    - Stronger applicability demonstrated for training, planning and mission rehearsal, than for mission execution

    Further experimentation and work is required

Lessons Learned from MSG-048
BML Challenges

- Simulation Model Requirements vary depending on:
  - Model domain
  - Echelon
  - Complexity
  - Level of automation
  - Level of detail
  - Nation-specific data (e.g. Tactics & procedures)

Systems need to ensure that information is used in a manner that is consistent with their internal models (i.e. pragmatic interoperability)

Lessons Learned from MSG-048
BML Challenges

- Need for increased Coordination of Tasks
  - Temporal associations
  - Control measures
  - Among participating units (e.g. Brigade operations)

- Operational Relevance
  - **Need to consult with the MIP** concerning operational relevance of BML as it relates to the JC3IEDM

Lessons Learned from MSG-048
BML Challenges

- Using BML for Tactical Command
  - Ensuring a consistent Common Relevant Operational Picture (CROP) across various C2IS fed by several reporting simulations

- Identified obstacles for future adoption of BML
  - Technical
  - Cultural
  - **Development of BML standard**

Lessons Learned from MSG-048
BML Challenges

- Many C2IS not designed to create/change plans rapidly during planning in order to exploit BML capabilities
  - COA Analysis (e.g. within a few minutes)

- Many C2IS not designed to receive reports at high rates
  - Need to limit system data production rates
  - Bundling of reports improved situation
  - Interest management is required (e.g. Subscription mechanism)

Lessons Learned from MSG-048

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Lessons Learned from MSG-048 Conclusions

- This presentation highlighted the technical and operational lessons learned during the MSG-048 technical activity.

- Does not include the final recommendations – currently being elaborated as part of the MSG-048 Final Report.

- BML has demonstrated much promise as an enabler for interoperability between C2, simulation and robotic systems.

- Work is still required to bring BML closer to operational deployment – especially work on standardization

- MSG-085 to start in 2010 as a continuation of the work done in MSG-048

Lessons Learned from MSG-048

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Questions ?